REMARKS

Favorable reconsideration of this application is respectfully requested.

Claims 1, 4-6, 14-24, 28-35, 40-42, 44-46 and 49-68 are present in this application. Claims 14, 15, 19-24, 28-35, 40-42, 45, 46, 50, 52-55, 57, 58, and 61-68 stand rejected under 35 U.S.C. §103(a) as unpatentable over U.S. 5,861,944 (Nishi) in view of U.S. 5,721,608 (Taniguchi). Claims 1, 4-6, 16-18, 44, 49, 51, 56, 59 and 60 have been allowed.

First, the Applicants gratefully appreciate the allowance of the above listed claims.

Second, the Applicants greatly appreciate the courtesy of an interview held between their representative and Examiner Brown on March 5, 2002. The rejected claims and the references were discussed in detail, but no agreement was reached regarding the patentability of the claims. One point discussed during the interview was the term "interval." Examiner Brown felt this term could have several meanings. In the amendments made to the claims, it has been clarified that the interval is a time interval. The present invention determines an appropriate interval for measurement, based upon the criterion or criteria recited in the various claims.

Turning to the prior art rejections, the Office Action discusses the Nishi reference on pages 2 and 3 of the Office Action. In particular, the Office Action finds measurement at any point implies an interval even if the interval is zero, and an interval is set in accordance with a previous measurement even if the inherent interval is constant for multiple measurements. Even if Nishi is viewed in this manner, the rejected claims, as clarified above, are patentably distinguishable over Nishi.

Claim 1 recites a method including a step of setting a time interval for measurement in accordance with change in exposure conditions. This is not disclosed or suggested by Nishi, which makes a measurement each time an exposure is made.

Claim 6 recites a step of setting a time interval for measurement of a transmittance in accordance with a variation amount of a transmittance of the optical system. This is also not disclosed or suggested by Nishi which makes a measurement at each exposure.

Claim 14 recites a step of setting a time interval for measurement in accordance with each of at least two exposure conditions. Nishi does not set a time interval based upon at least two exposure conditions.

In claim 16 there is recited a step of measuring a variation amount of the exposure light passing through the optical system in a predetermined time interval for measurement, and changing the predetermined time interval for measurement upon the measuring, in accordance with a comparison result. It is clearly not suggested by Nishi which makes no comparison.

Claim 22 includes a step of setting a time interval for measurement in accordance with each of at least two exposure conditions, which is also not disclosed or suggested by Nishi.

Claim 24 recites an exposure apparatus having a transmission measurement unit, and a control unit connected with the transmittance measurement unit to set a time interval for measurement in accordance with an exposure condition, which is also not suggested by Nishi.

The apparatus of claim 29 includes a control unit connected to the transmittance measurement unit to set a time interval for transmittance measurement of the transmittance measurement unit in accordance with a variation amount between a transmittance obtained by a most recent transmittance measurement and a transmittance obtained by measurement performed before the most recent measurement. There is no suggestion of such a control unit in Nishi which can set a time interval in accordance with a variation amount in transmittance.

The apparatus of claim 42 includes a control unit connected with the measurement unit to change the time interval of measurement performed by the measurement unit in accordance with a change in an exposure condition. There is no suggestion of such a system having a control unit as recited in claim 42 in Nishi.

The exposure apparatus of claim 44 includes a control unit connected with the measurement unit to change a time interval of measurement performed by the measurement unit in accordance with a comparison result of a variation of the first measurement of a light amount and a variation of a second measurement of light amount. There is no such control unit disclosed or suggested in Nishi.

Lastly, the apparatus of Claim 46 also includes a control unit connected with a measurement unit to set a time interval of a measurement performed by the measurement unit accordance with an exposure condition. There is no setting of any time interval based upon an exposure condition in Nishi.

It is also noted that claim 34 recites setting the time interval based upon a transmittance of the mask, and claim 35 recited setting the time interval based upon a minimum line width and a permissible exposure error. No such criteria are suggested by Nishi to set any interval.

Taniguchi is cited for the prediction function and even if such teachings could be combined with Nishi, there would be no suggestion of the methods or apparatus in the claims currently rejected, since Taniguchi does not remedy the deficiencies in Nishi.

The present amendment is submitted under the provisions of 37 C.F.R. §1.116 governing the entry of amendments after final rejection. This section provides for entry of amendments that improve the form of claims. Also, MPEP §714.12 states that amendments placing an application in condition for allowance may be entered. As the above amendments

are believed to do both, it is respectfully submitted entry of the present amendment is proper, and entry thereof is respectfully requested.

It is respectfully submitted that the present application is in condition for allowance and a favorable decision to that effect is respectfully requested.

Respectfully submitted,

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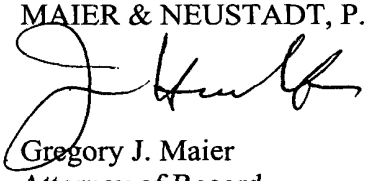

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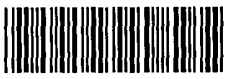

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IN THE CLAIMS

Please amend the claims as follows:

--1. (Twice Amended) An exposure method performed by an exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate, said method comprising:

photodetecting a part of said exposure light in an optical path of said exposure light;

setting a [measurement] time interval for measurement of a transmittance of said optical system which is arranged between a position of photodetecting a part of said exposure light and said substrate [to be different depending on] in accordance with changes in exposure conditions;

measuring a transmittance of said optical system at said set time [measurement] interval for measurement;

setting an exposure amount control target value in accordance with said measured transmittance of said optical system; and

transferring said pattern onto said substrate through said optical system, while an exposure amount is controlled based on photodetection results of a part of said exposure light and said set exposure amount control target value.

6. (Twice Amended) An exposure method performed by an exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate, said method comprising:

photodetecting a part of said exposure light in an optical path of said exposure light;

setting a [measurement] time interval for measurement of a transmittance of said optical system which is arranged between a position of photodetecting a part of said exposure light and said substrate in accordance with a variation amount of a transmittance of said optical system;

setting an exposure amount control target value in accordance with said measured transmittance of said optical system at said set [measurement] time interval for measurement; and

transferring said pattern onto said substrate through said optical system, while an exposure amount is controlled based on photodetection results of a part of said exposure light and said set exposure amount control target value.

14. (Twice Amended) An exposure method to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said method comprising:

setting a [measurement] time interval for measurement in accordance with each of at least two [an] exposure [condition] conditions; and

measuring a variation in the amount of said exposure light which passes through said optical system and reaches onto said substrate at said set [measurement] time interval for measurement.

15. (Amended) An exposure method according to Claim 14, wherein said two exposure [condition includes] conditions include at least one of an illumination condition to illuminate a mask, a transmittance of said mask, a minimum line width, and a permissible exposure amount error.

16. (Amended) An exposure method to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said method comprising:

measuring a variation in the amount of said exposure light passing through said optical system in a predetermined [measurement] time interval for measurement; and

changing said predetermined [measurement] time [intervals] interval for measurement upon said measuring, in accordance with a comparison result of a variation of a first measurement of said light amount and a variation of a second measurement of said light amount.

22. (Twice Amended) An exposure method to transfer a pattern illuminated with exposure light from a light source through an optical system onto a substrate, said method comprising:

setting a [measurement] time interval for measurement in accordance with each of at least two [an] exposure [condition] conditions; and

measuring an amount of said exposure light which passes through said optical system and reaches onto the said substrate at said [measurement] time interval for measurement.

24. (Twice Amended) An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate, said exposure apparatus comprising:

a branch optical system arranged in an optical path of said exposure light to branch a part of said exposure light;

an optical system arranged between said branch optical system and said substrate;

a transmittance measurement unit to measure a transmittance of said optical system;

a control unit connected with said transmittance measurement unit to set a [measurement] time interval for measurement of said transmittance measurement unit in accordance with an exposure condition;

an exposure amount setting unit connected with said transmittance measurement unit to set an exposure amount control target value in accordance with said measured transmittance of said optical system; and

an exposure amount control system connected with said exposure amount setting unit to control an exposure amount based on said set exposure amount control target value;

wherein said transmittance measurement unit measures a transmittance of said optical system at said set [measurement] time interval for measurement.

28. (Twice Amended) An exposure apparatus according to Claim 24, further comprising:

an information reading unit to read information of a mask on which the pattern is formed, and

said control unit automatically determines [measurement] time intervals for measurement of said transmittance measurement unit based on said information of said mask read by said information reading unit.

29. (Twice Amended) An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate, said exposure apparatus comprising:

a branch optical system arranged in an optical path of said exposure light to branch a part of said exposure light;

an optical system arranged between said branch optical system and said substrate;

a transmittance measurement unit to measure a transmittance of said optical system;

a control unit connected with said transmittance measurement unit to set a time interval for transmittance measurement [interval] of said transmittance measurement unit in accordance with a variation amount between a transmittance obtained by a most recent transmittance measurement and a transmittance obtained by a measurement performed before

said most recent measurement, said respective measurement-performed by said transmittance measurement unit;

an exposure amount setting unit connected with said transmittance measurement unit to set an exposure amount control target value in accordance with said measured transmittance of said optical system; and

an exposure amount control system connected with said exposure amount setting unit to control an exposure amount based on said set exposure amount control target value;

wherein

said transmittance measurement unit measures a transmittance of said optical system at said set time interval for transmittance measurement [interval].

34. (Twice Amended) An exposure apparatus according to Claim 24, wherein said control unit sets a [measurement] time interval for measurement of said transmittance measurement unit in accordance with a transmittance of said mask on which said pattern is formed.

35. (Twice Amended) An exposure apparatus according to Claim 24, wherein said control unit sets a [measurement] time interval for measurement of said transmittance measurement unit in accordance with one of a minimum line width and a permissible exposure amount error.

42. (Twice Amended) An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate, said exposure apparatus comprising:

a branch optical system arranged in an optical path of said exposure light to branch a part of said exposure light;

an optical system arranged between said branch optical system and said substrate;

a first sensor arranged in the optical path of a part of said branched exposure light to photodetect a part of said exposure light;

a second sensor arranged substantially flush with said substrate to photodetect said exposure light passing through said optical system;

a measurement unit connected with said first sensor and said second sensor to measure a variation in an amount of exposure light passing through said optical system, based on an output signal from said first sensor and output signal form said second sensor; and

a control unit connected with said measurement unit to change a time [an] interval of a measurement performed by said measurement unit in accordance with change in an exposure condition.

44. (Twice Amended) An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said exposure apparatus comprising:

a measurement unit to measure a variation in an amount of exposure light passing through said optical system; and

a control unit connected with said measurement unit to change [an] a time interval of a measurement performed by said measurement unit, in accordance with a comparison result of a variation of a first measurement of said light amount and a variation of a second measurement of said light amount.

46. (Twice Amended) An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said exposure apparatus comprising:

a measurement unit to measure an amount of exposure light passing through said optical system and reaching onto said substrate at a predetermined time interval; and

a control unit connected with said measurement unit to set said time interval of a measurement performed by said measurement unit in accordance with an exposure condition.

66. (Amended) An exposure method according to Claim 19, further comprising:

measuring a transmittance of said optical system at a predetermined time interval, and

correcting said transmittance time-varying prediction function each time a transmittance measurement is performed.

67. (Amended) An exposure method according to Claim 66, wherein said predetermined time interval of said measuring said transmittance is determined in respect to a relationship with a required exposure precision.

68. (Amended) An exposure method according to Claim 66, wherein said time interval of said measuring said transmittance is

short when a rate of change in said transmittance of said optical system is large, and

long when said rate of change in said transmittance of said optical system is small.--